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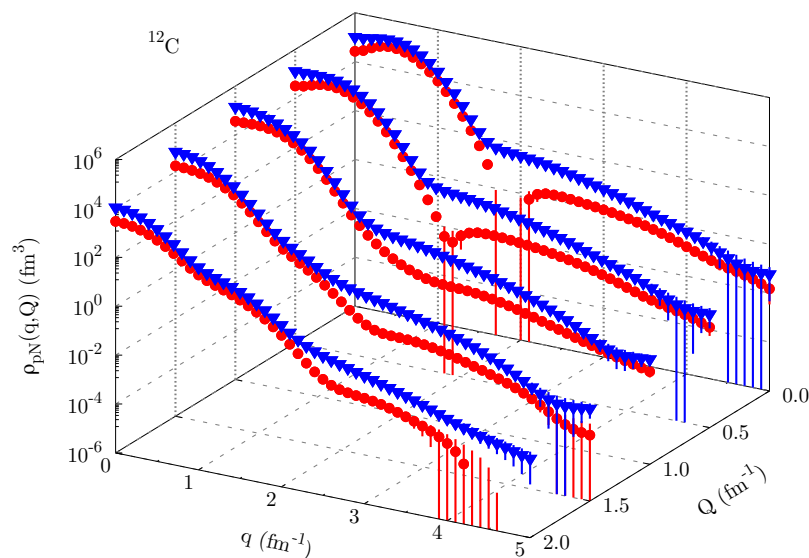
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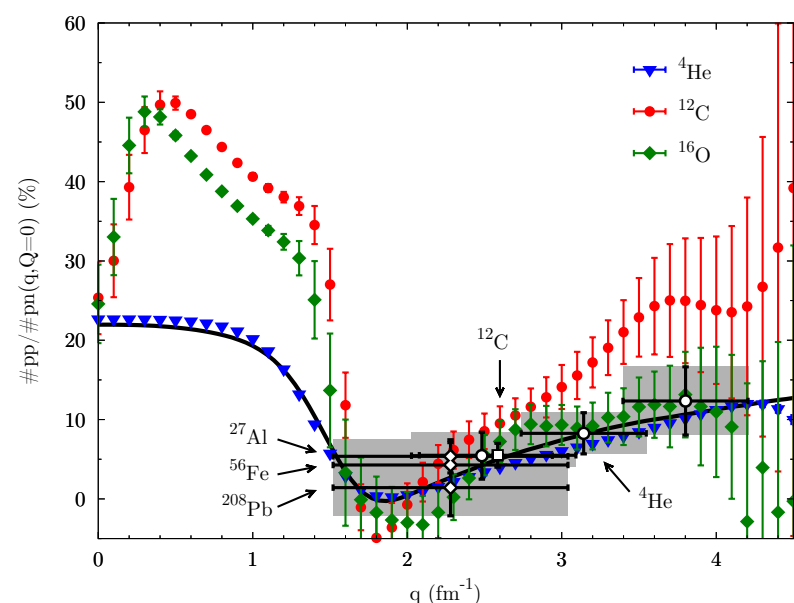
Nucleon momentum distributions for local chiral interactions

Objectives

- We use quantum Monte Carlo methods to calculate single- and two-nucleon momentum distributions in ^4He , ^{12}C , and ^{16}O .
- We use correlated many-body wave functions optimized for local chiral interactions up to next-to-next-to-leading order (N^2LO).



Two-nucleon momentum distributions in ^{12}C as a function of both relative and center-of-mass momentum of the pair (q and Q).



pp pairs to pn pairs ratio in $A = 4, 12, 16$ nuclei as a function of the relative momentum q for back-to-back ($Q = 0$) pairs. Black symbols are extracted from experimental data.

Impact

- A collection of momentum distributions for p-shell nuclei has been produced for local chiral interactions at N^2LO . This largely extends the momentum distribution database, previously available for phenomenological potentials only, and it provides the possibility of examining the scheme and scale dependence of various properties of interest.
- The description of the momentum distributions at low and moderate momenta is similar to that provided by phenomenological potentials, while higher momentum components are typically reduced, consistent with the lower-energy regime of chiral interactions.
- The results for back-to-back pairs confirm the large pn to pp pairs ratio in the regime $q \approx 1.5 - 2.5 \text{ fm}^{-1}$ up to ^{16}O , which appears to be nearly independent of the employed interaction scheme.
- The pp to pn ratio for local chiral interactions at N^2LO is compatible with available experimental data extracted from electron scattering experiments in the range $q \approx 2.5 - 4.0 \text{ fm}^{-1}$ up to $A = 16$.

Accomplishments

D. Lonardoni, S. Gandolfi, X. B. Wang, and J. Carlson,
[Phys. Rev. C 98, 014322 \(2018\)](#)